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UNITED STATES DEPARTMENT OF AGRICULTURE

BULLETIN No. 1084

Washington, D. C. ▼ June 30, 1922

INSPECTION OF FRUIT AND VEGETABLE CANNERIES.

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INTRODUCTION.

The food inspector has many functions which vary with the terms of the law under which he operates and with the form of the organization which directs his activities. His two primary functions,

[1] In the compilation of this bulletin free use has been made of material from unpublished reports of food inspectors of the Bureau of Chemistry, U. S. Department of Agriculture, who work under the terms of the Federal Food and Drugs Act, especially that collected by the committee appointed by the chief of the bureau for the purpose, and from the following U. S. Government publications: Department of Agriculture Bulletins 569, "The Sanitary Control of Tomato-Canning Factories," by B. J. Howard and C. H. Stephenson, and 196, "Methods Followed in the Commercial Canning of Foods," by A. W. Bitting; Bureau of Chemistry Bulletin 151, "The Canning of Foods"; Department of Commerce, Miscellaneous Series, Bulletin 54, "Canned Foods"; and circulars issued by the War Department giving instructions and specifications pertaining to the inspection of canned fruits and vegetables.

Acknowledgment is made to H. H. Wagner, C. S. Brinton, A. Stengel, and W. R. M. Wharton for helpful criticism and suggestions in the revision of the manuscript.

essential under any form of effective food-law control, however, are to observe and report on the operation of food factories.

This publication considers the two primary functions as applied to the inspection of fruit and vegetable canneries. It does not take up the many other duties which may devolve upon the food inspector, nor does it attempt to go into his legal powers or authority, as these depend upon the particular law under which he operates. It is intended to furnish information on the inspection of fruit and vegetable canneries which will be helpful in operating under any food-control law. The point of view from which the material is treated is confined to the making of cannery inspections for the purpose of preparing a report that will serve as a basis for administrative action in the enforcement of a food-control law. In both the selection and treatment of material this publication differs from one intended to serve as a guide for increasing the efficiency of the cannery processes or to indicate how an inspection in purchasing canned food should be made.

ELEMENTS OF CANNERY INSPECTION.

RELATIONS WITH THE PROPRIETOR.

Establishing right relations with the proprietor is the first important step in making an inspection of a cannery. Approach the man in charge in a courteous, dignified manner. An arrogant attitude, based upon powers conferred by legal authority, excites antagonism and is always inexcusable. The food inspector is the authorized representative of a Federal, State, or city government engaged in the performance of a duty imposed by law, the right performance of which will be of benefit to the proprietor and to the public, as well as a credit to himself and to the service which he represents.

The inspector will find that it increases his efficiency to be uniformly courteous and dignified, regardless of the attitude of the proprietor. Even when the proprietor shows reluctance to having an inspection made, or places obstacles in the way of the inspector in securing the information he needs, the inspector's object can best be attained through handling the situation in a calm and courteous manner. In assuming that people are honest and willing to do the right thing and in approaching them on that basis, the inspector will be right most of the time. Furthermore, this assumption will tend to inspire men with the desire to do the right thing.

Little difficulty will be experienced in obtaining exact information when the cooperation of the proprietor is freely given. In examining complicated processes, the member of the factory force who is accompanying the inspector may overlook some details with-

out any intention to be misleading. Because of his familiarity with the complex machinery, he may omit to mention the use for which certain units are employed, or it may be difficult for him to describe a process in the noise and confusion of the factory. Do not assume that he is deliberately withholding information unless subsequent events prove that such is the case. In order that no part of his explanations will be overlooked, misconstrued, or misunderstood, a safe rule is to take enough time to understand each piece of machinery and its purpose, making notes and illustrations when desirable.

EXAMINATION OF RAW MATERIALS.

Examine critically all raw fruits and vegetables on hand. In studying the raw materials, ascertain where they are produced. Do they come from farms owned or leased by the canner or are they purchased from independent growers? Learn how they are transported to the cannery, whether by wagon, truck, or train. It is important to find out the time that elapses from the picking or harvesting until the fruits and vegetables reach the cannery and the time they are held at the cannery before processing.

Observe carefully whether the raw fruits and vegetables are green, partly mature, ripe, or overripe, and to what extent, if any, they are decayed, bruised by rough handling, defective because of insect stings or fungus injury, or frost bitten. Note the containers in which they are delivered to the cannery. Freedom from bruises and crushing is attained only by the use of suitable containers. Berries should be in small boxes as for the market, and corn, peas, and beans should be handled in such a way that they will not heat. Ask about the weather during the growing and harvesting season and study the general climatic conditions of the section. The climate and its variations have a direct bearing on the quality of the finished product.

Ascertain all the varieties of each product handled regularly, so that later in the inspection statements about the varieties appearing in the labeling may be checked. As a rule, the variety is mentioned only in the labels of fruits and vegetables having one or more varieties for which there is a greater demand than for the others. When a particular variety is specified in the label, it is important that the inspector should know whether or not that variety is actually put into the can.

The importance of starting with fresh, sound, clean, properly matured fruit or vegetables can not be too strongly emphasized. No matter how careful or efficient the canning process may be, it can never improve the quality of unsound fruit or vegetables.

SURROUNDINGS OF THE CANNERY.

Make a survey of the surroundings of the cannery, noting every feature that may have a bearing on the health and efficiency of the employees or the wholesomeness and quality of the finished product. Is the cannery surrounded by high buildings that obstruct the light? Are any near-by factories giving off offensive fumes or odors? A fertilizer plant, for instance, in the immediate vicinity of a cannery should be reported.

The draining of the cannery should be as nearly perfect as possible. Every cannery has large quantities of waste products, such as trimmings, cores and peelings, and these, if allowed to accumulate in open containers or in drains near the cannery, become a source of contamination. Observe the locations of stables, pigsties, privies, and the like, which might breed flies, or, because of nearness to the cannery, become a source of contamination to the water supply. Is the factory on a dusty road or street, or are the approaches to it sprinkled or oiled and kept in such a condition that the minimum quantity of dust enters the building?

CANNING PROCESSES.

The efficient inspector gives careful attention to every detail of the canning processes for each product put up in the cannery, as the processes vary with the different fruits and vegetables. Note the number and the make of machines and any peculiarity in their method of operation or the way in which the product is handled from start to finish.

The processes of sorting, grading, washing, and preparing the fruits and vegetables, and filling, exhausting, capping, then processing or sterilizing and cooling the filled cans are common for all fruits and vegetables. These processes should be studied separately, the inspector noting any defects that might in any way affect the quality of the finished product.

SORTING.

The elimination of all rotten, partly rotten, or otherwise defective fruits or vegetables is the chief object in sorting. Efficient sorting can not be done without good light. Where natural light, which is always to be preferred, is not available, sufficient electric or other good artificial light should be provided for the sorting tables. Observe the number of sorters and their skill as evidenced by the effectiveness of their work. Determine the rate of speed with which the products pass the sorters. Are there any turning devices on the tables to enable the sorters to see the product from all sides? All arrangements that contribute to the comfort of the sorters make for greater efficiency.

Grading for size is usually done by machinery. While important, grading for size, texture, and color is secondary to the elimination of defective products. Examine the fruit or vegetables after they pass the sorters to see whether or not any defective products pass, and if so, what percentage.

WASHING.

Give careful attention to the method of washing and note the make and kind of machines used. There is a tendency on the part of some canners to depend too much upon sterilization, neglecting both sorting and washing. Note the sufficiency and purity of the water supply, which sometimes runs low, resulting in inefficient washing. Is the wash water flowing continuously? If not, how often is it changed? A common arrangement for washing is a tank of water which is agitated so as to cause the fruits or vegetables to move gently through the water toward one end of the tank, from which they are elevated and forced under a strong spray of water as they leave the tank. The effectiveness of the spray depends both upon its force and upon its volume. A good spray is valuable in removing dirt and mold from the surface of the fruits or vegetables. Peas and some other similar products are often washed in a revolving cylinder called a "squirrel cage," but other machines are also used for this purpose. Examine specimens of the fruit and vegetables after they come from the washing process to see if any dirt or mold still clings to them.

PREPARATION.

In the preparation of fruits and vegetables for canning, such operations as peeling and cutting to size, in fact all those that are performed by hand, should be done by workers free from communicable diseases. Apples, pears, and usually peaches are peeled and cut to size; peas are shelled and blanched; corn is husked, silked, and cut from the cob; beans are snipped, strung, and blanched; asparagus is cut into lengths and blanched; sweet potatoes and beets are peeled. Is all the waste discarded or is it utilized for any purpose? All waste should be used or discarded promptly, not allowed to accumulate and ferment.

Blanching is not for the purpose of changing the color, as might be inferred from the name, but it is a parboiling to make the product more suitable for packing in the can. Vegetables are usually blanched for from 1 to 5 minutes. Blanching causes a softening of the tissue and in some cases removes mucous substances from the surfaces.

FILLING.

The method of filling the can depends upon the product. Peaches, pears, apples, and the like are put in the can by hand, but special machines have been adapted for many fruits and vegetables. The

inspector should observe what method is used for washing the cans before the filling process is begun, since dirt and dust may accumulate in cans during transportation and storage. Give careful attention to the machines used for filling, especially their control and regulation. Do they result in a uniform fill? As soon as the fruit and vegetables are put in the can, the sirup or brine is added. Cans should be filled as full of solid food as is practicable, with only such quantity of sirup or brine as is necessary for proper processing. Are any spices or other substances used in addition to the brine or sirup? Note the degree of sirup used, for the different grades, and also the strength of the brine.

As water is one of the cheapest adulterants, the inspector should give careful attention to ascertaining whether or not it is added in a greater amount than is necessary. He should discover also whether the cans are "slack filled," that is, contain too much brine or sirup and too little solid food. Slack fill may be due to deliberate intention of the canner, to imperfect control of the filling operation, or to a lack of knowledge of what is a standard fill. The effect on the consumer is exactly the same in each case.

Observe whether the method of exhausting is by heating the product or by capping in vacuum, and give the names of the machines used. Report whether the cans have open or soldered tops. What method is used in testing the cans for leaks after they have been sealed? State the make of or describe the sealing machines.

PROCESSING.

The inspector should note and describe in his report the whole operation of processing, including the machinery used. When practicable ascertain the pressure and the temperature employed and the time for reaching the maximum in the case of all the products canned. How are these factors controlled? Find out whether the time, temperature, and pressure as stated in any directions that may be issued by the manager are carefully observed by the employees. Since overprocessing may make the fruit in the can soft or otherwise undesirable, some canners occasionally underprocess. As this sometimes fails to kill the microorganisms present, spoilage may follow, attended by the possibility that botulism lurks in the can.

Are the different batch numbers marked? If so, how? Is a record kept of the temperature, time, and pressure of each batch? This may be important later in tracing the cause of any spoilage that occurs. If a spoiled can is identified by a batch number and careful records of that batch have been kept, the cause of the spoilage may be determined and the responsibility for it fixed.

COOLING.

Describe the methods, temperature, and time of cooling the cans. Prompt and adequate cooling is essential in the case of certain products, such as tomatoes, peas, and string beans. Some canners believe that the cloudy liquor occasionally found in canned peas and beans is caused by an excessive fill before the brine is added. As a matter of fact, it usually is due to insufficient cooling of the hot cans in cold water before they are placed in the storehouse. Canned tomatoes, peas, and string beans may be spoiled by "stack burning" unless they are quickly and thoroughly cooled as soon as they are removed from the process kettle.

FINISHED PRODUCTS.

Examine the stock of filled cans, noting the manner in which they have been stored and any evidence of spoilage or defective processing. Look especially for signs of swelling in the cans. So-called "swells" indicate spoilage, for the normal can has straight sides and flat or slightly concave ends. Convex or bulging ends indicate the probability of spoilage. Some cans, called "springers," however, have slightly convex ends caused by overfilling or incomplete exhausting. The ordinary swell is the result of gas formation within the can and usually indicates spoilage. One type of bulging is caused by the presence of hydrogen liberated by the action of the contents on the metal of the can, not by spoilage of the contents of the can. The so-called "flat sours," another form of spoilage, do not make the cans swell. This form can be detected only by the acidity test or by the taste. Look also for signs of rust in the cans; rusty cans may develop leaks.

Report the annual output of each product. Ascertain how long on the average the stock is held in storage before shipment. Is there any stock from packs of previous years on hand? If so, how much and how long has it been held? How is the stock stored? What is its condition? What disposition is made of returned "swells"?

Examine carefully the contents of some of the cans in stock. Test the vacuum of the can. Note the odor immediately upon opening. If the inspector is familiar with the characteristic odor of the sound fruit or vegetable, he will have little difficulty in detecting any spoilage that may have developed in the cans. Note the flavor and the consistency of the product and the clearness or the turbidity of the liquor. Are any pods, leaves, stems, or other foreign or decayed matter present? Attention should be given to the quantity of the contents of the can. Weigh the can filled and sealed, weigh separately the brine or sirup drained from the

can, and then weigh separately the fruit or vegetables after the brine or sirup has been drained off; also weigh the empty cans.

The inspector should know the standard drained weights for the various fruits and vegetables in cans of different sizes. The Bureau of Chemistry has published standards of drained weight for a number of fruits and vegetables, copies of which may be obtained upon application to the bureau. If the department in which the inspector is working does not have standards of its own, the standards adopted by the Bureau of Chemistry will be found useful as a guide.

Both short weight and slack fill may be due to lack of proper control of the filling operation, to carelessness in the control of the filling operation, or to deliberate intention to put in short weight or too much brine or sirup. Spoilage may be due to underprocessing, to defective containers, or to the use of imperfect or unfit materials. If, in examining the finished product, the inspector finds any evidence of short weight, slack fill, or spoilage, he should endeavor to ascertain the cause, if his inspection up to this point has not already indicated it.

GRADES.

The lack of standardization of grades for fruits and vegetables makes it difficult for the inspector to detect any but the more glaring misstatements regarding grades. The grades for fruits and vegetables vary not only in different sections of the country but even with different packers in the same section. Furthermore, one packer's grades not infrequently vary from year to year. This is sometimes due to the variations in the fruits and vegetables caused by differing seasons or other factors in the growing of crops. Until grades have been legally standardized, the food-law official can do little more than prevent flagrant misbranding in this respect. The matter of variations in grade can usually be settled between buyer and seller by price adjustment.

If the fruits and vegetables in the can are good and wholesome, the question of whether they are the highest grade or the standard grade, under existing conditions, makes little difference, so long as they are not misbranded and are sold for a price that is fair for the grade in the can. Injury is done to the consumer when the canner attempts to put out a standard grade for an extra fancy grade, at the price of the extra fancy grade. The question of how much the inspector may really do in the matter of grades depends, of course, upon the terms of the law under which he is operating.

The inspector should know how many grades are being put up by the canner and how each grade is designated on the label. Watch particularly for the tendency to make a lower grade appear on the labels as a higher grade. Grading for size is largely done by ma-

chines, but grading for quality—such as uniform texture and color—is done by hand. The inspector should know how carefully the grading is done, the means for supervising or controlling it, how the grades are designated upon the labels, and to what extent differences in grade are emphasized upon the labels.

In issuing instructions to inspectors of canned foods the Army defined grades as follows:

Foods may be graded according to size or quality, or both. Grading for size is largely mechanical, whereas grading for quality (uniform texture, color, etc.) is usually by hand. The various grades do not follow fixed standards, but vary according to locality and weather conditions of the season. There is a tendency at present toward uniformity and standardization of grades.

FRUITS.

The higher grades differ mainly in the size of the pieces of fruit and in the strength of the sirup. *Sirup strength* is usually measured by degrees on a hydrometer. The Balling and Brix hydrometers both give directly the percentage of sugar in solution. For example, a 40° sirup consists of 40 pounds of sugar and 60 pounds of water in 100 pounds of sirup. Since the Brix hydrometer is used most frequently in the large fruit-canning sections in the West, densities in this manual will be expressed in Brix degrees unless otherwise stated.

The Baumé hydrometer, which has an arbitrary scale, is sometimes used. The following table shows the relation between the Baumé and Brix readings:

Degrees Brix (per cent of sugar).	Degrees Baumé.
10.0	5.6
20.0	11.1
30.0	16.5
40.0	21.9
50.0	27.2

It should be borne in mind that after the fruit is cooked with the sirup the density of the latter on the finished product will not be the same as when added.

California Fruits.

California fruits present the greatest number of grades, which in general are as follows:

(1) *Special extra.*—Choicest specimens of prime, ripe, large fruit, even in color and texture, and perfectly peeled, pitted, or prepared. Very heavy sirup (about 50°) is used and the product is almost a preserve. The production of this grade is limited in quantity.

(2) *Extra.*—Large, prime, ripe fruit of uniform size, evenly colored, of fine texture, free from blemish, and packed in heavy sirup (about 40°). Cleaning, peeling, pitting, etc., must be perfect.

(3) *Extra standard.*—Prime, ripe fruit of slightly smaller size and less regular than extra, and packed in about 30° sirup. The quality of the fruit and its preparation are almost equal to the extra. The quality of this grade is high in value.

(4) *Standard.*—Fruit smaller in size than extra standard, or orchard run after removal of culls; not so uniform in ripeness nor so even in color as (3); may have some blemishes; packed in about 20° sirup.

(5) *Seconds.*—Small, hard, or off-colored fruit and irregular pieces, packed in weak sirup (about 10°).

(6) *Water or pie grade.*—Similar to seconds; may also contain soft or overripe fruit; packed in water.

Other Fruits.

In localities where the fruit crop is not so abundant the number of grades and their requirements may be curtailed. Baltimore fruits have been graded as follows:

(1) *Extra.*—Similar to extra standard as above or better, except that the sirup is weaker (20° and upward).

(2) *Standard.*—Similar to standard as above, except that the sirup is weaker (about 10°).

(3) *Seconds.*—Similar to seconds as above, except that the fruit is packed in water.

(4) *Water or pie.*—Similar to same grade as above.

VEGETABLES.

Grading for size is independent of true grading for quality. This varies according to the nature of the vegetable and will be taken up under the separate items. The smaller sizes are more tender and these grades of size are approximately grades of quality.

Quality.—The condition and quality of the food itself is the main factor in grading vegetables. The composition of the liquor varies but slightly for the different grades. Salt and sugar are added to bring out the flavor, the tendency in some cases being to increase the sugar added to the higher grades.

(1) *Fancy.*—Prime material; uniform and tender in quality; of good flavor and color, and carefully prepared. In case of products packed in brine, the liquor should be clear or only slightly turbid.

(2) *Standard.*—Field run, of good stock, and of less uniform selection than (1). There may be slight discoloration, or breaking, due to processing. Sometimes there is an extra standard grade between (1) and (2).

(3) *Substandard, offstandard, or seconds.*—Wholesome, nutritious material, below (2) in quality.

LABELS.

The inspector should examine carefully all the labels used. Compare the statements on the labels with the facts developed by the inspection. Are the labels truthful in every detail? Is the quantity of contents in the cans stated correctly or does the label state that there are 1 pound and 4 ounces in the can when it contains only 18 or 19 ounces? Is the statement of the quantity of contents plain and conspicuous? Does the label bear any extraordinary claim as to the quality or grade of the food in the can not borne out by the facts developed by the inspection? Is the name of the canner correctly given upon the label? If the name of any firm or person other than the canner is placed on the label, it should be qualified by such words as "packed for" or "distributed by," to indicate that it is not the name of the canner. If any substance has been substituted in whole or in part for the substance named on the label, is there any indication of this fact upon the label? Does the label show that waste materials,

such as trimmings, stems, and cores, have been used when such is the fact? If certain varieties of fruits or vegetables are specified on the labels, the inspector should ascertain whether or not those varieties are actually in the can.

The inspector should familiarize himself with all the decisions and regulations on labeling issued under the law which he is enforcing. He should study the labels in the cannery in the light of the facts developed by his inspection to determine whether all the regulations and decisions are being complied with. The time of inspection is the time to check statements on the labels, for they can be verified then.

Copies of all the labels used on the different grades and cans of various sizes put out by the cannery being inspected should be obtained. These should be dated, identified, and attached to the factory inspection report, so that the reviewing officer may have them before him when examining the report.

EMPLOYEES.

The appearance of the employees of a canning factory is an index of the conditions the inspector may expect to find throughout the factory and also an indication of the cleanliness and quality of the finished product. Is there a sufficient number of unskilled laborers for cleaning, scrubbing, disposing of waste, moving raw material, and the like? Do the employees generally appear to be alert, quick, and intelligent? Cleanliness and tidiness of their clothes will tell the observing inspector much.

What precautions are taken by the manager to see that the employees are free from all contagious diseases? People with running sores are especially unfit for employment where food is handled. Is there evidence of any tubercular or venereal disease or the like? Report the total number and the sex of all employees.

CLEANLINESS.

A wholesome, sound food product can not be produced in an unclean establishment. Cleanliness relates directly to the health of the consumer. No matter how good the raw material may have been at the start, if cleanliness is neglected during the canning process the food in the can is likely to be contaminated, and there is always the probability that it may be dangerously contaminated. Furthermore, this is one of the features that can not be detected by the consumer by examining the can.

While the sanitary features are important in all food factories, they are of greater importance in some kinds of factories than in others. For instance, in the inspection of a mill feed factory, cleanliness is of less importance than the facilities that the manufacturer

has for mixing and adulterating his feeds; on the other hand, in a cannery cleanliness is of first importance. In every step of his work, the inspector should give careful attention to this feature. An elementary knowledge of the conditions favorable to the growth of microorganisms will greatly aid him in making efficient inspections. The cleanliness which satisfies many housekeepers and many managers of canning plants is not usually sufficient from the point of view of the food inspector. Unless they are clean, small crevices, nooks, and corners become breeding places for millions of microorganisms.

The canning industry is widespread. A great deal of canning is done in small canneries near the fields where the fruits and vegetables are produced, where adequate water supply and drainage facilities may be lacking. The canner does not always appreciate the necessity for sterilizing his apparatus and for maintaining that degree of cleanliness which insures a wholesome product. The specialists of the Bureau of Chemistry have sometimes found conditions far from satisfactory on the premises of canners who sincerely believed that they were doing everything necessary to keep their canneries in a first-class, cleanly condition. Examination revealed many sources of contamination. In many instances the canners have expressed surprise when the possibility of contamination through such sources has been pointed out. The inspector should make a very careful examination of every factor that has a bearing on this important point. A general survey of the whole process and equipment will at once reveal flagrantly unclean practices or conditions, but very close inspection is required to find the sources of danger in those places which are on the border line and which to outward appearance are clean.

Walls which are either painted white or whitewashed are a great aid in keeping the cannery clean, making the rooms lighter and so revealing any cobwebs or dirt. Wooden floors should be water-tight to prevent refuse from getting under the building where it will undergo fermentation, thus producing bad odors and an insanitary condition that will render ineffective every other precaution for cleanliness. Floors in certain parts of the factory must be scrubbed and flushed frequently, an added reason for having water-tight floorings.

The inspector should observe the cleaning equipment on hand. This is in itself an index to the cleanliness of the cannery. Note the water taps, their number, and how conveniently they are located for cleaning all parts of the factory. Is the hose supply adequate? Note the number and kinds of scrub brushes and brooms. Brushes should be stiff, of split rattan or steel-wire bristles. Live steam, while essential for cleaning, is not sufficient alone to insure cleanliness. Stiff scrubbing brushes or brooms must also be used. Mold stick-

ing to the woodwork may not always be removed by the application of steam, but it usually yields to a good stiff brushing. Painters' triangles are very useful for cleaning crevices and corners which can not be reached by a brush. The inspector will find a flashlight very useful in examining dark places where dirt is most likely to occur.

Special attention should be given to the method of disposing of waste, including parings, trimmings, cores, and the like. If any part of these trimmings are utilized in canning, the inspector should find out exactly how and ascertain whether the labels of the finished product bear a statement which shows clearly that they are made in whole or in part of such trimmings. The waste of a cannery should never be allowed to accumulate about the premises. Examine drains, sewers, and other means for disposing of such waste. Observe whether plumbing and sewer pipes are trapped effectively.

Give special attention to the toilets. Only those of modern, sanitary construction should be near the factory. Ordinary outside toilets should be a safe distance from the cannery, with their vaults screened against flies, and meet other sanitary requirements. Disinfectants should be used liberally. Make sure that the water supply to the cannery can not be contaminated from this source.

Ventilation is essential to the sanitary condition of the factory and to the health and comfort of the employees. Note the number, size, and location of windows and doors. Observe the number and kinds of ventilators in the roof. What provision is made for the elimination of escaping steam?

Plenty of natural light, which is an excellent disinfectant, not only contributes to the sanitary condition of the cannery, but is essential to the most efficient work of the employees.

Every cannery should have an abundant supply of pure water, and the inspector should carefully inquire into its source. Is it from streams that might be polluted? Shallow wells are not desirable because the water in them may become contaminated from surface drainage. If there is any suspicion as to the condition of the water, the inspector should consider the advisability of taking a sample for bacteriological analysis. Specific instructions for collecting such samples can be obtained from bacteriologists. In order to make thorough cleaning possible, the water used for this purpose should have a high pressure.

TOMATO-CANNERY INSPECTION.

More canneries handle tomatoes than any other single fruit or vegetable, and, as a rule, tomato canneries vary more than the others in processes, cleanliness, and equipment, and in the quality of the fin-

ished product. A large number of small tomato canneries are run by proprietors who have little knowledge of sanitation or the technique of canning. Canned tomato products have been the basis of more actions under the Federal Food and Drugs Act than has any other single product.

TYPES OF TOMATO PRODUCTS CANNED.

There are two general types of canned tomato products: (1) Tomatoes canned whole or in solid pieces; and (2) tomato pulp, purée, or paste, and similar products. Some canneries put up both types, using the best grade tomatoes, of uniform size, for the first, and the less desirable tomatoes, sometimes the trimmings, for the second class. Most canneries, however, put up only whole tomatoes, and a few are devoted exclusively to the manufacture of ketchup, pulp, purée, and the like.

SUITABLE TOMATOES.

Tomatoes best suited for canning whole or in solid pieces are smooth, making it possible to peel them easily, and have a clear, ruddy color. It is desirable to have them of moderate, uniform size and regular in shape. Some varieties which are fairly uniform in shape and size are much better adapted for canning than other varieties. The smaller and misshapen tomatoes may be used for making pulp and purée.

While the food inspector should report the varieties used, he is much more interested in the factors which affect the cleanliness and purity of the finished product, such as the degree of maturity, the absence of decayed spots, and the freedom from mold. Is the meat of the tomato firm, pulpy, or watery? Are there any sunburned spots, insect ravages, or evidences of blight?

Tomatoes should be picked frequently and delivered promptly to the cannery. Good tomato crates are wide and flat rather than deep. Tomatoes become bruised or crushed when delivered in deep boxes and when subjected to rough handling. Ripe tomatoes deteriorate quickly, so that it is a great advantage to have them grown near the cannery and handled promptly at every stage.

WASHING.

Washing is the first operation in many tomato canneries. The inspector should note the type and make of washer used and how efficiently the washing operation is performed. According to Howard and Stephenson (U. S. Department of Agriculture Bulletin 569), the principal types of washers in use are the following:

The apron washer.—This carries the tomatoes on an openwork apron through an inclosed chamber where strong sprays strike the tomatoes at different angles.

The rotary washer.—This consists of an inclined cylinder covered with a wire screen of 1-inch mesh. It will remove some of the soft-rot tomatoes as well as the dirt, but has a tendency to crush some of the very ripe tomatoes.

The paddle agitator.—This consists of slowly revolving paddles in a tank of water which cause the tomatoes to rub against one another, thus loosening the dirt. The tomatoes are gradually worked along toward the conveyor, which removes them from the tank and passes them under sprays of water which give them a final rinsing.

The air-blast washer.—This produces agitation and movement of the tomatoes by blasts of air entering the tank at or near the bottom. Otherwise it is similar to the paddle agitator type.

The cascade washer.—This has a tight-bottomed conveyor inclined at an angle of 30° to 50°, which carries the tomatoes upward. A stream of water flows through inlets near the top, down over the ascending tomatoes.

Many variations of these types of washers are put out by different manufacturers. The inspector should carefully observe the tomatoes after they come from the washer in order that he may determine how effective the washing process has been.

PEELING AND TRIMMING.

After being washed and scalded, the tomatoes for canning are usually delivered to the peelers by belts, by movable table tops, or in pails or pans. They are peeled and cored, and rotten spots or other undesirable parts are removed. Note the cleanliness and state of health of the peelers. Observe the cleanliness of the utensils used in carrying the peeled product from the peelers and the method of disposing of waste. Ascertain definitely whether or not the trimmings are used in the manufacture of pulp or paste, and if so, what care is taken to eliminate all rotten or unfit parts from the trimmings. All buckets or pans used for handling the peeled tomatoes should be kept clean. All tables or conveyors in which the peeled tomatoes are placed should be thoroughly washed when the plant shuts down at noon and at night, and stops should be made for this specific purpose at other times, if necessary, to keep them in first-class sanitary condition.

FILLING.

Tomatoes are put in the cans either by hand or by machines. When they are packed by hand, the sanitary or open-top can is used. Note the kind of filling machine, several types of which are made. Cans filled by hand are sometimes weighed in order to regulate the amount put in each one. When machines are used the inspector should note the size and capacity of the filler employed and give special attention to the method of controlling the quantity put in

the can. Are the cans in which the tomatoes are placed perfectly clean? Ascertain particularly whether any water is added to the product. Look out for short weight, slack fill, and the addition of pulp or purée.

PROCESSING.

Note the method, time, and temperature of exhausting and the method of sealing and processing. Report the make, size, and capacity of the machine used. What is the time, the pressure, and the temperature at which the processing is done? Is a number assigned to each batch processed?

TOMATO PULP.

Tomatoes which are to be made into pulp or purée, for use in the manufacture of ketchup or soup, are sorted by hand, usually before scalding, and put through a cyclone which crushes them into a pulp and eliminates the seeds, cores, and peelings. The essential point to be observed by the inspector is that no wholly or partially dirty, moldy, or rotten tomatoes go into the cyclone. Tomato pulp and purée are of such a nature that as much as 20 per cent of decomposed matter may be present without being detected by the consumers. Since the complete elimination of rotten material is expensive, the temptation for the canner to become careless in this respect is ever present.

PULPING.

The most essential thing for the inspector to ascertain in the pulping operation is the kind of material from which pulp, purée, or paste is made. What precautions are taken to eliminate the rotten and other undesirable parts? Efficiency in washing and a most careful sorting are essential in securing a good product. It is also highly important that tomato stock be handled promptly at every stage. Pulp is an ideal field for the growth of bacteria, molds, and yeasts. Molds sometimes grow on conveyors and on cyclone paddles, as well as in more out-of-the-way places. Their presence always indicates a lack of thoroughness in cleaning. The inspector should give special attention to the conveyors and pipes through which the pulp flows in order to determine their accessibility for cleaning, as well as by what means and how thoroughly they are cleaned in actual practice. He should also find out the degree of concentration of the pulp and how it is regulated.

Valuable information on the making of pulp and the canning of tomatoes is given in United States Department of Agriculture Bulletin 569, "The Sanitary Control of Tomato-Canning Factories," copies of which may be obtained by application to the Division of Publications, United States Department of Agriculture, Washington, D. C.

INSPECTOR'S REPORT.

PURPOSE.

The report of the inspector giving the results of his observations during a cannery inspection serves as the basis for action by the administrative officers. The report should present a clear picture of the sanitary condition, equipment, processes, and labels of the cannery, so that the reviewing officer can determine whether or not the cannery and its output meet the requirements of the law which he is administering. The report should be clear in every particular, leaving no doubt upon any point. In making his report the inspector should be as fair as is humanly possible—fair to the proprietor of the cannery, fair to the administrative officer under whose direction he is operating, and fair to the people for whose benefit food laws are enacted.

ASSEMBLING FACTS.

Report all pertinent facts and be sure of all the facts reported. No subsequent action on the part of the inspector can make amends for carelessness in this respect. While it is not practicable to take elaborate notes of all the details observed at the time of making the cannery inspection, the inspector should make such notes as may be necessary to insure a complete and accurate report. It is well for him to assemble his facts, and, where possible, to complete his report while in the town in which the cannery is situated, so that, should he find that he has missed some important details or is not certain of some pertinent fact, he can secure the additional information or verify the fact.

EMPHASIS.

Some facts observed by the inspector will be of more importance than others in passing judgment upon a particular cannery. Emphasize the pertinent points, but keep in mind the fact that the particular points upon which emphasis should be placed vary in different canneries. The purpose of emphasis is to more clearly set forth the truth. If the inspector's observation has shown him that a cannery is not in a sanitary condition, facts which go to show that condition should be brought out clearly. There is, of course, danger of overemphasizing unimportant things in a measure that will mislead the reviewing officer. But if the inspector remembers that the purpose of emphasis is to give the reviewing officer a clear idea of the factors that make the cannery's condition good, bad, or indifferent, as the case may be, he can use the principle of emphasis to advantage and avoid burying the essential facts of his report under a mass of irrelevant matter.

102636—22——3

FORM.

The following form, with appropriate headings for reporting the inspection of a pea cannery, illustrates a method for reporting a cannery inspection. Such a form is suggestive, and not to be followed as an iron-clad rule. The report should be made in detail on blank sheets, properly paragraphed under suitable headings. Any of the headings here listed which are not applicable to a particular cannery may be omitted and pertinent points other than those indicated on the form may be treated on additional sheets under appropriate headings devised by the inspector.

(1) GENERAL:
- (*a*) Date of inspection.
- (*b*) Name of proprietor.
- (*c*) Post office address (cannery office).
- (*d*) Legal status of proprietor (independent owner, partnership, corporation).
- (*e*) Subsidiary or related firms.
- (*f*) Products canned.
- (*g*) Amount of output.
- (*h*) Territory in which output is distributed (names of consignees of recent shipments).

(2) CANNERY BUILDINGS:
- (*a*) Number and construction of buildings.
- (*b*) Surroundings.
- (*c*) Kind and condition of floors, walls, and ceilings.
- (*d*) Light.
- (*e*) Ventilation.
- (*f*) Facilities for cleaning.

(3) SANITARY AND COMFORT FEATURES:
- (*a*) Drainage and sewage system.
- (*b*) Kind and condition of toilet, wash, rest, and dressing rooms.
- (*c*) Is factory screened or otherwise protected against outside dirt, flies, etc.?
- (*d*) Water supply, source, volume, etc.

(4) EMPLOYEES:
- (*a*) Number.
- (*b*) Sex.
- (*c*) Health.
- (*d*) Cleanliness.
- (*e*) Dress.
- (*f*) Character of work.

(5) GROWING AND HARVESTING THE PEAS:
- (*a*) Varieties, seed.
- (*b*) Planting, successive control, possession farmer or factory.
- (*c*) Maturity.
- (*d*) Time cut vines lie in field.
- (*e*) Radius of haul.
- (*f*) Season, frost, etc.
- (*g*) Field damage.
- (*h*) Mowing, harvesting.
- (*i*) Disease, insects.

(6) PEA VINER:
- (*a*) Type and make.
- (*b*) Rented or owned.
- (*c*) Location, field or factory.
- (*d*) Construction.
- (*e*) Cleaning.
- (*f*) Box containers.
- (*g*) Amount of damage to peas.
- (*h*) Ensilage, vines, composition.
- (*i*) Control of deliveries to viner, weight of loads.
- (*j*) Deliveries of shelled peas.
- (*k*) Disposition of refuse that does not enter ensilage.

(7) SHELLED PEAS:
- (*a*) Weighing of shelled peas.
- (*b*) Price paid per pound for shelled peas.
- (*c*) Storage of peas before processing.
- (*d*) Cleaner or clipper, make, disposition of tailings.

(8) WASHER:
- (*a*) Make.
- (*b*) Description, "squirrel cage," etc.
- (*c*) Results obtained.

(9) CONVEYORS:
- (*a*) Belts, spouts, pails.
- (*b*) Galvanized, wooden.

(10) SORTING AND REMOVAL OF DEFECTIVE AND IMPERFECT PEAS:
- (*a*) Tables, gravity, moving belt.
- (*b*) Rejects.
- (*c*) Completeness of work.

(11) GRADING:
- (*a*) Name and description of grades put up.
- (*b*) Gravity solutions, formula, specific gravity.
- (*c*) Rotary screen, make, meshes.
- (*d*) Sizes (page 34).

(12) BLANCHING:
- (*a*) Make of apparatus.
- (*b*) Temperature.
- (*c*) Time.
- (*d*) Revolutions.
- (*e*) Soda; if used, give formula showing percentage amount.
- (*f*) Are all grades given same blanch?
- (*g*) Results obtained.

(13) CANS:
- (*a*) Make.
- (*b*) Size.
- (*c*) Variety.
- (*d*) Cleaning.
- (*e*) New or old.

(14) FILLER:
- (*a*) Make.
- (*b*) Size and capacity.
- (*c*) Adjustments, for different grades.
- (*d*) Are consecutive deliveries uniform in weight? If not, to what are variations due?

(15) BRINER:
- (*a*) Formula, kind of sugar and salt.
- (*b*) Variations in the liquor or sirup.
- (*c*) Amounts added.
- (*d*) Temperature.
- (*e*) Absorption of brine.
- (*f*) Flavor or preservatives.

(16) SEALER:
- (*a*) Make.
- (*b*) Capacity.
- (*c*) Description.
- (*d*) Acid, solder.
- (*e*) Efficiency.

(17) PROCESSING:
- (*a*) Retorts or sterilizers, make, grouping capacity, operation.
- (*b*) Time bringing up to maximum temperature and pressure.
- (*c*) Time held.
- (*d*) Pressure.
- (*e*) Swelling of peas during processing or cooking.
- (*f*) Results obtained.

(18) COOLING:
- (*a*) Method employed.
- (*b*) Retorts.
- (*c*) Tanks.
- (*d*) Results obtained.

(19) PROMPTNESS IN HANDLING.

(20) FINISHED PRODUCTS:
- (*a*) Mark on cans with key.
- (*b*) Storage.
- (*c*) Amount of output; R. R. facilities.
- (*d*) Capacity.
- (*e*) Price list.
- (*f*) Shipments, local, interstate, export.
- (*g*) Distribution.

(21) FILL OF CAN:
- (*a*) Each grade, weight of cans—
  - Empty.
  - Sealed, filled.
  - Brine, drained from filled can.
  - Peas, drained from filled can.
- (*b*) Amount of peas necessary to fill can.
- (*c*) Variations filling machine.
- (*d*) Scales used.

(22) QUALITY:
- (*a*) Maturity.
- (*b*) Flavor.
- (*c*) Color.
- (*d*) Uniformity, mixed.
- (*e*) Turbidity of liquor.

(23) WASTE:
- (*a*) Vines and peas.
- (*b*) Spilled peas on floor.
- (*c*) Picking tables.
- (*d*) Material removed from interior of viner, cleaning.
- (*e*) Blancher liquor.
- (*f*) Defective cans, swells and returned, percentages applicable to various grades.
- (*g*) Injured peas in viner and clipper, percentage.

(24) PERSONS INTERVIEWED.
- (*a*) Name and attitude of each.

(25) EXHIBITS:
- (*a*) Photographs, description, and designation of those attached.
- (*b*) Labels, description, and designation of those attached.

(26) REMARKS AND RECOMMENDATIONS, INCLUDING ADDITIONAL SUBHEADS AND POINTS FOR SPECIAL EMPHASIS.

POINTS FOR SPECIFIC PRODUCTS.

The statements regarding processes in this section, especially those specifying time and temperatures, are based upon the observations of inspectors in certain commercial canneries. They do not necessarily describe the ideal processes and no recommendation is made or implied that they should be followed. They are set forth to give the inspector an idea of what is done in commercial canneries, rather than to furnish canners with information on the best processes.

FRUITS.

APPLES.

Since some varieties keep well in their natural state, the canning of apples is perhaps of less importance than the canning of other fruits which constitute a smaller part of the diet but do not keep well unless dried or canned. The chief varieties of apples canned are Baldwin, Greening, Spy, and others of the better fall and winter apples. The summer apples turn soft and mushy in the can. The chief grades are the fancy, standard, and pie. The fancy grade is put up in sirup, the degree of sirup varying in different canneries. The best seller is the No. 10 can, packed in water for pies.

Canned apples should be prepared from matured, sound fruit, thoroughly washed and cleaned, well peeled, cored, and free from decay, bruise, or discolor, and damage caused by disease or insects. The peeling and coring may be done either by hand or by machine.

The inspector should determine the character, quality, and disposition of the waste from apple canning.

APRICOTS.

The canning of apricots is principally a California industry. The season extends from June 15 until about September 1, being heaviest in July. The chief varieties of apricots for canning are the Blenheim and the Moorpark.

The fruit is washed, the pits are removed by hand, and the fruit is graded as green, regular, and ripe. The green and regular grades are further graded in 6 sizes by being passed over copper screens having perforations which vary $\frac{1}{8}$ inch in the different sizes. The largest perforation is $1\frac{5}{8}$ inches in diameter and the smallest is $1\frac{3}{8}$ inches in diameter. The smallest grade is made up of apricots that pass through the $1\frac{3}{8}$-inch screen, and the largest is composed of those that pass over the $1\frac{5}{8}$-inch screen. Fruit of each size is conveyed, usually by belt, to a packing table designated for that size, and dumped into troughs containing clear, cold water. Pieces which are spotted or rough or imperfect in shape are packed in separate cans as a rough grade. As the ripe fruit is usually too soft to stand being passed over the grader, it is graded and packed by hand. It brings a slightly higher price than the other grades.

The cans are next conveyed to the siruping machines, where they are filled with sirup of the proper degree, ranging from 55° in the highest grade to 10° in the lowest grade in which any sirup is used. They are then exhausted, sealed, and cooked for the necessary period of time. The water grade is packed in water. The pie grade, which usually consists of overripe and broken pieces and any pieces unsuitable for the other grades, is packed in water. Some canners are now putting up a "solid-pack" pie fruit, that is, apricots packed solid in the can without the addition of water or sirup. A large pack of apricots peeled by hot lye solution (p. 25) is also made.

The inspector should give special attention to the water and pie grades, making sure that no floor sweepings or decayed or wormy fruit have entered the cans. Since apricots are handled a great many times by hand, the cleanliness and health of the workers and the sanitary conditions of the factory are important factors.

BERRIES.

The principal berries canned are strawberries, loganberries, gooseberries, and blueberries. There is a great variation in the grade of berries. In some localities little grading is done, and not more than three grades are put up anywhere except in California, where some canners use the following scheme of grading: Special extra, put up in 60° to 70° sirup; extra, put up in 40° sirup; extra standard, put up in 30° sirup; standard, put up in 20° sirup; seconds, put up in 10° sirup; and water or pie, packed in water.

Strawberries.—Strawberries are usually delivered to the canneries in shallow boxes or small baskets, dumped into small trays or pans, and carried to tables where they are capped by hand and sorted into three, four, or more grades according to the practice of the cannery. As a general rule, three grades are packed, special extra, standard,

and water or pie. Strawberries are or are not washed to remove sand and dirt, according to the practice of the individual cannery. The washing consists of a quick rinsing in pans or sinks of cold water or by a light spray. The berries are then removed by hand and placed in cans. Lacquered cans are generally used in order to better retain the color of the berries. Overripe strawberries are not washed. The sirup or water is then added, and the cans are exhausted for from 3 to 5 minutes at about 212° F. The No. 2 cans after capping are processed in continuous cookers for from 8 to 10 minutes at about 214° F. or for from 10 to 17 minutes in open cookers at 210° to 212° F. A longer period for exhausting and cooking is required for the No. 10 cans. From the cooker the cans are placed in tanks of cold water to stop the cooking and reveal the presence of any leakers. After packing some canners weigh each can, then exhaust for 5 or 6 minutes, and add sugar in definite quantity. Then the cans are filled with boiling water, capped, and processed. Under this method it is necessary to agitate the cans in some manner during the cooking period.

Loganberries.—Great care is used in handling loganberries, which contain a large percentage of juice and are exceedingly delicate and easily bruised. In a few canneries the berries are washed by being dipped for an instant in cold water, but in the majority of canneries they are neither dipped nor sprayed with water, for the reason that such treatment might remove a portion of the juice. The operations of sorting, grading, and filling the cans are usually performed by girls. It is now customary to weigh a definite and uniform amount of fruit into each can. Sanitary type cans, enamel lined, are used. The firm berries are usually segregated into two sizes and dropped into two sets of cans, No. 2 and No. 2½. The bruised and soft berries are packed in No. 10 cans as water or pie grades. Hot sirup of proper density, or water as the case may be, is added to the cans which are then passed through the exhaust box, capped, seamed, and sterilized. The No. 2 and No. 2½ cans receive a 3-minute exhaust and the No. 10 cans a 10-minute exhaust, the temperature in each case being from 180° to 190° F. The processing varies according to the style of equipment. Where agitating steam cookers are used, the No. 2 and No. 2½ cans are processed for 3 minutes, and the No. 10 can for from 8 to 16 minutes, according to the quality of the fruit. The temperature of the cooker is maintained at from 214° to 215° F. Where the processing is accomplished by placing the cans in boiling water, the time necessary for sterilizing is materially increased, being from 8 to 14 minutes for the No. 2 and No. 2½ cans and from 25 to 40 minutes for the No. 10 cans, depending upon the ripeness of the fruit. Loganberries are put up in the usual commercial grades. In making

inspections, attention should be given to the condition of the fruit as delivered to the cannery, whether fresh and clean, or soft, dusty, and possibly moldy, to the care taken for maintaining proper and uniform fill of cans, and to the general methods of labeling.

Blackberries.—Blackberries are handled in much the same way as are strawberries. All grades are packed in No. 2 cans and a small quantity of some grades is packed in No. 1 cans. About 75 per cent of the entire pack is water grade and put up in No. 10 cans. Blackberries are not washed unless they happen to be particularly dirty. The special extra grade generally takes a 40° or 50° sugar sirup. Other grades follow the usual custom.

Blueberries.—The canning of blueberries, among the few wild fruits canned, is confined chiefly to the State of Maine, although small quantities are put up in other States. The berries are cleaned by blowing out the leaves and stems by machines and by hand picking. Most of them are packed in No. 2 and No. 10 cans. Canned blueberries are used almost exclusively for pies.

Gooseberries.—At the cannery gooseberries are first run through a snipper to remove the stems, then dumped into tubs or pans of cold water from which they are picked by hand and graded. Size, firmness, and appearance are the qualities chiefly considered in making a special extra grade. The only other grade packed to any extent is the water grade. Gooseberries are placed in cans by hand and treated like other berries. The special extra grade is usually put up in a No. 2 can, and the water grade in a No. 10 can.

Raspberries.—The canning operations for raspberries are very similar to those for strawberries. Raspberries are graded according to size and firmness. The bulk of the pack is marketed in a special extra grade, in No. 2 cans, taking a 50° or 60° sugar sirup. The water grade is packed in No. 10 cans. Raspberry bushes are sufficiently erect to protect the fruit from soil contamination, so that the berries are fairly clean and it is not customary to wash them.

CHERRIES.

Both sweet and sour cherries are canned, the former principally on the Pacific Coast, and the latter in Michigan and New York. Sweet cherries are usually packed unpitted, while the sour cherries are usually pitted. After delivery to the canneries in lug boxes, the cherries are run through a washer, stemmed by hand or by a machine stemmer, and worked over a machine which grades to size. The different sizes are carried to tables where the cans are filled by hand. Cherries are pitted by machine. All the usual commercial grades are packed, principally in the No. 2½ cans, although No. 2 and No. 10 cans are also used. After the addition of sirup or water,

according to the grade, the cans are exhausted for from 3 to 5 minutes, capped, and processed in open or continuous cookers for from 20 to 25 minutes, after which they are cooled in a water bath.

The inspector should watch out for an excessively large number of pits in canned cherries.

FIGS.

Figs are sorted by size. No definite grades for them have been established. After the rough portion of the skin is removed, the figs are heated with sugar in jacketed kettles, so that the sirup becomes so heavy that they are nearly a preserve. They are packed in 4-ounce, No. 1, No. 2, and No. 10 cans, and in individual glass containers.

GRAPES.

Two varieties of grapes are principally used for canning, the Muscat in the west and the Niagara in the east. Only a comparatively small quantity of grapes is canned, and that chiefly for use as pie fruit. The grapes are stemmed by hand, machine graded to size, washed, and placed in cans. After the addition of hot sugar sirup or water, the cans are capped and processed for about 14 minutes at 212° F. in open or continuous cookers. The bulk of the pack is water or pie grades, although small quantities of the other commercial grades are put up by a few canneries.

OLIVES, RIPE.

The canning of ripe olives is confined almost exclusively to California, although small quantities are put up in Arizona. The olives are usually graded in five or more sizes, those smaller than 9/16 inch in diameter generally being used for making oil. The size graduations are usually made on a difference of about 2/16 inch. The California Olive Association has adopted the following grades:

Olives to the pound.	Grade.	Olives to the pound.	Grade.
120–135	Standard	65–75	Mammoth
105–120	Medium	55–65	Giant
90–105	Large	45–55	Jumbo
75– 90	Extra large	35–45	Colossal

The olives are first taken to pickling vats, where a quantity of 1½ to 2 per cent caustic soda solution, in weight about 5 times that of the olives, is poured over the fruit, and allowed to stand for from 6 to 8 hours with frequent stirring. This liquor is then drained off and the olives are exposed to the air for 24 hours, with occasional stirring. More of the same or a weaker solution is applied for an equal length of time and again run off and the fruit aerated. This operation is performed a third time, or until the caustic reaches the pit, as indicated by a darkening of the flesh. The lye solution is then run off

and fresh water is added to the vat. The water is changed about every 12 hours until all the lye is washed off. At this point the salting of the olives is begun by introducing them into a solution of brine of gradually increasing strength of about 1, 2, and 4 per cent salt. The complete operation requires from three to four weeks' time. The olives are soaked about two days in each of the different solutions, after which they are canned in a 3 or 4 per cent brine and sterilized.

The inspection should determine whether the olives labeled as ripe are fully ripe. If the olives are held in brine solution before canning, examine for evidence of bad fermentation and objectionable odors. If minced olives, olive paste, or similar products containing minced olives are made, pay particular attention to the quality of olives entering the product. Ascertain especially the temperature used in sterilization and the periods of time employed for the packages of various sizes and what factory means are used for temperature control. Pickling rooms should be free from mashed and spoiled olive litter; the floors should be clean and so constructed that they may be kept so. Are the vats free from scum or filth and do any of them contain spoiled, mushy, or soft olives? What disposition is made of the spoiled and damaged olives? Are they removed to a safe distance from the factory?

PEACHES.

While peaches are grown in nearly all parts of the United States, most of the canned peaches come from California and Georgia. Some varieties of this fruit are not suitable for canning. The following varieties are canned: Foster, Muir, Lovell, Salway, and Yellow Free or Yellow Crawford, all of which are freestone peaches, and Phillips, Tuscan, Johnson, Walton, and Albright Cling, all of which are clingstone varieties. Peaches should be canned as soon after picking as possible. They are first pitted and then peeled by hand, by lye, or by slipping the skins. Nearly all the peaches canned in California are lye peeled. They are carried on belt conveyors through a peeling lye solution containing from one-half to 1 pound of concentrated lye to a gallon of water, then through several automatic washing machines containing cold water. To prevent darkening of the product and to make the fruit more flexible, so that a better fill can be obtained, peaches are heated or blanched for a few minutes. Blanching, however, is unnecessary if the peel has been removed by lye peeling or slipping the skins.

After being halved, the peaches are passed over a series of grading screens having meshes $1\frac{3}{4}$, $1\frac{7}{8}$, 2, $2\frac{1}{4}$, and $2\frac{3}{8}$ inches, respectively, in diameter, which divide the fruit into six sizes, those passing through the $2\frac{3}{8}$-inch mesh constituting the highest grade. Overripe and

underripe fruit and that which must be trimmed extensively to remove blemishes is packed as second, water, or pie peaches.

The cans are filled by hand. Peaches in No. 1 cans are exhausted for 1½ minutes and processed for 15 minutes at 212° F. Those in No. 2½ and No. 3 cans are exhausted for 3 minutes and processed for 20 minutes at 212° F. Those for No. 10 cans are exhausted for 5 minutes and processed for 35 minutes at 212° F. These figures vary according to the degree of ripeness of the fruit. The time is materially shortened by the use of an agitating cooker. All the usual commercial grades are put up. The sirup runs from 55° in the highest to 10° in the seconds, and no sugar is used in the water or pie grades.

Special attention should be given to the matter of the fill of the can and to the cleanliness and health of the employees.

PEARS.

All work on pears is done by hand because of their peculiar shape and texture. They are graded, peeled, cored, and packed in halves. The special extra grade is of such a size that 8 or 9 pieces will fill a No. 2½ can, evenly matured, of fine texture, perfectly peeled and cored, and packed in 40° sirup. The extra grade has the same qualities, but may have from 9 to 12 pieces to a can and be put up in 30° sirup. The extra standard has the same qualities, but may have from 10 to 14 pieces in the can, with a 20° sirup. The standard grade is a pear of good quality but less uniform in size, color, and quality than the preceding grade. More tolerance is permitted in peeling and coring, and a 15° sirup is used. Seconds consist of small soft pears, cut in irregular pieces, and packed in 10° sirup. The lowest grade has the same quality as the seconds, but is packed in water. Pears are packed in No. 1, No. 2, flat No. 2, No. 2½, and No. 10 cans.

Since a great deal of the work on pears is done by hand, the inspector should give special attention to the cleanliness and health of the employees.

PINEAPPLES.

The pineapple industry is confined chiefly to the Hawaiian Islands, although pineapples are canned in a few places in the United States. The fruit is harvested by hand. It is usually necessary for men to go over a given field several times, gathering each time only those pineapples that are in proper condition for shipping and canning. The cut fruit is gathered in piles at the end of rows and there graded as No. 1, No. 2, and No. 3, according to the weights. A good grader needs no scales, as his eye and hand become very accurate. The fruit is carefully placed in heavy wooden boxes and transferred to the cannery, where it is trucked to the various sizing machines in ac-

cordance with the grading already done in the field. These sizing machines square the ends of the fruit, remove the shells in three pieces, cut out the cores in cylindrical form, and size the fruit to fit the can.

The cored and sized fruit drops onto a conveyor belt which carries it along the trimming tables. Standing on either side of the table the trimmers cut off any portion of the peel which may have been missed by the sizer. After being trimmed, the fruit is returned to the belt and carried to the slicing machine, where it is cut crosswise into disks or slices. The slices are then passed along the conveyor belts to the packing tables, where the different grades are sorted out and packed in cans.

Essentially four different grades or classes of fruit are packed. In the fancy grade, the slices must be cored perfectly, with no bit of the peel remaining and no imperfections from trimming cuts on the outer edge. The fruit must be fully ripe, with a good, rich color. In the standard grades the slices need not be perfectly cored, and they may have one or two slight imperfections on the outer edge. The color of the fruit of this grade may be a little less rich than that of the fancy grade pineapple. The fruit, however, must be good. The third or substandard grade slices are those that are not suitable for the first two grades but have not been broken to pieces. A slice with a decided hole in the edge is sometimes packed as the third grade. The fourth grade includes cores, broken pieces, and grated materials, all of which are canned separately and labeled appropriately.

The packed and graded cans go to the sirup machines, where each grade receives a sirup of a different strength. The open cans of fruit are next passed through the open exhaust box, where they are held, according to different practices, for from $2\frac{1}{2}$ to 6 minutes at the temperature of live steam. Immediately after being exhausted, the cans are passed on to the closing machines, where the covers are sealed on, sanitary seal cans being used in all cases.

Two general methods for sterilizing are employed. In one, the cans in large crates handled by cranes are placed in large open vats of water heated by steam coils. The cans are kept in the boiling water for from 30 to 40 minutes. In the second method there is some device for keeping the cans in continuous motion. The cans need be kept in the boiling water for only approximately 14 minutes.

One of the greatest problems in the pineapple industry is the utilization or disposition of the waste or by-product. The proportion of the whole pineapple that is not suitable for canning varies from 50 to 60 per cent. Attempts have been made to utilize the waste in various ways. The inspector should note whether any of it is allowed to ferment in or near the cannery.

PLUMS.

The Green Gage, Yellow Egg, and Damson plums are the principal varieties canned. Plums are packed when fairly ripe and soft. On account of the checking or cracking of the skins during processing many canners hold the fruit for several days, allowing it to wilt, which lessens the tearing of the skin and makes a more sightly pack. The fruit is first run over a grader and separated into four sizes, 1, 1¼, 1½, and 1¾ inches in diameter.

After the plums have been washed, the imperfect and spotted fruit is sorted out and the rest is packed in cans by hand. Plums are not peeled. A hot sugar sirup or water is added, and the cans are exhausted, capped, and processed in continuous cookers, for from 8 to 14 minutes, or in open cookers, for from 36 to 38 minutes, at about 212° F.

Plums follow the usual commercial grades for fruits and are packed in No. 1, No. 2, No. 2½, and No. 10 cans.

PRUNES.

While prunes are usually dried, a large quantity is also canned, especially for shipping to the Tropics or to foreign countries. Usually three grades are packed. The extra grade is packed in 30° sirup, the standard grade in 20° sirup, and the lowest grade in water. They are put up in No. 2½ and No. 10 cans.

VEGETABLES.

ARTICHOKES.

Artichokes are gathered by cutting off the bulb as close to the head as possible and they are delivered to the canneries in crates. Some canners use the whole artichoke; others remove the outer scales and often the tops of the inner leaves, leaving only the hearts. The artichokes are allowed to stand for 48 hours in a solution consisting of 5 per cent salt and one-half of 1 per cent citric acid in water. The acid is added to prevent discoloration. Vinegar is sometimes used in place of citric acid. The artichokes are next blanched for from 5 to 7 minutes in a hot, light brine solution, after which they are drained and placed in cans with fresh brine. The filled cans are exhausted, capped, and processed, as in the case of other vegetables. The time of processing varies with the size of the cans.

Three grades of trimmed artichokes are packed. The best consists of the largest of the most tender heads, which are trimmed down close and known as "baby hearts." The next grade includes the smaller and less tender heads. The third grade comprises all artichokes unfit for the other grades. They are packed in No. 2, No. 2½, and No. 10 cans.

Inspection should show whether the blanching agents used are in violation of the law and whether the net weight is correctly stated.

ASPARAGUS.

More than 90 per cent of the asparagus canned in the United States is put up in California. The white stalks are more desirable for canning purposes than the green stalks.

The asparagus is cut, packed in lug boxes of about 40 pounds each, and hauled to the cannery by wagon or boat early in the morning. It is then sorted by women into two grades, green and white. Each color is next sorted by the women, usually into six uniform sizes, known as giant, colossal, mammoth, large, medium, and small. These names apply to the circumference of the stalk and not to the length. As the stalks are sorted, each size is stacked carefully, stem end out, in wooden boxes having one end open, the sides of which are slightly shorter than the height of the can into which the asparagus is to be packed. The women then cut off even with the box the protruding ends of the stalks. The asparagus is next dumped into wicker or wire baskets, blanched in boiling water, sprayed for a minute or so with cold water, conveyed to the packing tables, and dumped into troughs containing cold water. The women pack the stalks vertically in the cans. The cans are then filled with about 11° brine, exhausted, sealed, and cooked in retorts for varying lengths of time, according to the size of the can and the condition of the asparagus. The pack of tips only, that is, the top or blossom end of the stalks, is quite large. These tips are also graded into green and white and into five sizes. They are usually about 3 inches long and are packed in a No. 1 square tin in the same manner as the regular stalks.

Occasionally a fungus, called in the trade "rust," which produces a brown discoloration on the stalk, makes its appearance in certain districts. Some packers may be careless in handling the "soup tip," as a result of which many dirty or decayed pieces or trimmings are included, rendering it filthy and decomposed. Because of the fact that each individual stalk is handled by operators, particular attention should be paid to the sanitary conditions and to the cleanliness of the employees.

BEANS.

The principal varieties of beans used in canning are Refugee, Lima, Navy, and Red Kidney. Refugee beans are canned for their pods, which are fleshy, crisp, and tender, rather than for the seed. The beans are sorted by machine, according to their diameter, the larger ones being cut to definite lengths, and filled into the can by weight. They are packed in No. 2, No. 2½, No. 3, and No. 10 cans.

Wax beans are handled in the same manner. Lima beans are shelled and packed both green and ripe. The beans are graded for size by sieves. The Navy bean is the one most generally used in packing pork and beans. The Red Kidney bean is packed either plain or with tomato sauce. In general, beans are canned in the following four ways: With pork and tomato sauce; without pork and with tomato sauce; with pork and plain sauce; without pork and with plain sauce.

Usually beans are put up in at least three grades. Inspectors should give attention to the variety canned and check this up with the labels in use. There has been a tendency on the part of some canners to use the names of varieties which are in much demand for cans in which other varieties are packed. This has been particularly true of Red Kidney beans. Attention should be given also to the labeling of baked beans. Beans cooked by steam in cans should not be labeled "Baked beans."

A large proportion of the green Lima bean pack of the United States is grown and canned in New Jersey. The small Lima beans from the Bush Lima are used exclusively in four canneries which put up probably from 75 to 85 per cent of the entire pack in the United States. The procedure and machinery used in canning Lima beans are almost identical with those used in canning peas. The outline on pages 18 to 20 of this bulletin may be followed with little or no change.

After the Bush Lima bean vines are harvested, the beans are beaten out in a pea viner. The harvesting is done when the beans reach the stage of maturity at which the canner, who usually grows most of the beans he packs, believes he will get the greatest return from his crop. This is the condition when some of the beans are small and immature while others on the same or adjacent plants are so mature as to be white. As a result the shelled beans are a mixture of green and white beans. The beans are cleaned, washed, and graded into two or three sizes as described on page 33. Some canneries put up a portion of their pack as "field run," but all make an attempt to separate them. In some plants the separation is done imperfectly in a mechanical brine separator such as is used in pea canneries. This separator is not entirely satisfactory, but it reduces the quantity of whites to be removed by hand. In other plants the separation of whites is done entirely by hand picking.

The cleaned beans are blanched in hot water, then rinsed with cold water, and filled into the cans by machinery. The small green Lima beans require great care and attention to detail during the process in order to make sure that the cans shall be entirely full of beans and brine and the two so proportioned that the beans are just covered by a clear, transparent brine. Since beans of varying

maturity are canned at different times during the day as different parts of the fields are harvested, the operator must make corresponding changes in the time of blanching and in the quantity of beans delivered to the cans. The very small green beans require a short blanch, and, as they swell little during the final processing, a larger quantity of them is needed to fill the can. Conversely, the more mature white beans require a much longer blanch to attain a maximum swell. A perfect fill can be secured with the all-green beans in No. 2 cans, but it can seldom be reached with the white beans in No. 10 cans. It is impossible for the operator to put up a high-grade pack of beans without cutting the cans from time to time during the day and adjusting the time of blanching and the quantity delivered by the filler as changing conditions demand.

BEETS.

Beets are topped in the field and delivered in lug boxes to the canneries where they are first washed in cold water and then passed through a scalder. The roots are cut off and the outside skins are removed by hand. After rewashing in cold water, the beets are hand packed, whole, in slices, or in broken pieces, the slicing ordinarily being done by machines. The cans are passed through an exhaust box for from 5½ to 7½ minutes at a temperature of 212° F. After a hot, weak brine solution is added, the cans are capped and processed in a continuous agitating cooker for from 5 to 12 minutes, according to the size of the can and the character of the beets. In open cookers the time is proportionately longer. The canner aims to secure a bright rather than dark color in the finished product. The pack is graded as standards and seconds, the standard grade being subdivided into large whole, medium whole, and small whole, while seconds consist of pieces and broken slices.

Inspectors should give attention to the raw material used, to the fill of the can, and to the statement of the net weight.

CARROTS.

The tops are cut off in the field and the carrots are delivered to the canneries in lug boxes. After being washed in cold water they are either lye peeled or hand scraped, although some canneries run them through two weak lye solutions instead of one strong solution. They are then washed in cold water to remove the lye. The roots are cut off and the eyes trimmed out, after which the carrots are quartered, all by hand. They are then placed lengthwise in the cans and packed tight. After a 5½ to 7½ minute exhaust at 212° F., a hot brine is added and the cans are capped and processed in a manner similar to that used for beets. They are graded as standards or seconds, the latter consisting of short lengths and pieces.

The principal points to observe in making an inspection are the quality of the raw material, the composition of the peeling solution, the fill of can, and the statement of net weight.

CAULIFLOWER.

The commercial canning of cauliflower as a vegetable is limited, the bulk of the crop being preserved in brine for pickle packers. The salted cauliflower is washed to remove the excess salt, blanched, and sealed. Fresh cauliflower is boiled in hot salt solution and packed in tins while warm. The interstices are filled with a hot, weak salt solution and the cans are immediately sealed to prevent exposure to air and darkening of the product. Sterilization must be done carefully or the pack will be mushy, brown, and foul smelling.

The inspector should give special attention to the quality of the cauliflowers used for canning.

CORN.

Corn is canned principally in two styles. By the first, which originated in Maine, the kernels are cut off and the milky portion is scraped from what remains on the cob. The cut and scraped corn is mixed with a sweetened brine. The product is thick and creamy in consistency, showing no separation of liquor. Corn packed in this way in other places than the State of Maine is called "cream corn," and sometimes incorrectly "Maine style." The use of the term "Maine style" on corn packed in any State other than Maine is considered a misbranding under the Federal Food and Drugs Act. In the second, or Maryland style, the whole grains are packed in brine. Corn is delivered to the cannery on the ear. The husks are removed by machinery in the larger canneries and by hand in the smaller ones. The corn is then dropped on a conveyor, from which the defective and worm-eaten ears are picked out, the good part being sent to the trimmer. Corn is put up in four grades: Fancy; extra standard; standard; and substandard, or seconds.

Most of the work in the modern cannery is done by machinery, such as huskers, silkers, cutters, mixers, cookers, and fillers. The corn, handled by automatic machinery, after receiving a preliminary heating by steam, is evenly mixed with brine and packed in the cans. The corn enters the cans at about 180° F. and the capping is done in the usual manner. No. 2 cans are sterilized at a temperature of 250° F. for 80 minutes. Some packers process at 245° F. for 100 minutes, and others process twice to insure keeping, for corn is one of the most difficult foods to process.

The inspector should give particular attention to the character of the raw material used and to the fill of can.

HOMINY.

The selected white corn used in making hominy is shelled and then screened to take out all small defects or split grains and any chaff or foreign substances. It is next washed and given a treatment of hot solution of lye, during which time it is constantly cooked and agitated until the tough hull loosens. The strength of the lye and the length of time required for cooking vary in different factories. The time of cooking ranges from 20 to 45 minutes.

After the lye has accomplished its work the corn is run through a cylinder which removes the hull and tops. The corn is next washed. Some canners soak the corn over night so that the kernels will swell to the maximum before canning; others soak and cook it for only an hour or two or fill the cans at once, depending upon the swelling in the processing. The soaking has the effect of getting rid of traces of lye and makes a more tender kernel and a clearer liquor. Hominy is usually put up in two grades.

PEAS.

It is highly important that peas be put in the can as soon as possible after they are picked. For this reason a great many packers either grow their own peas or build the cannery as near as practicable to the fields where the peas are grown. When the peas are well grown and still tender, the vines are cut by mowing machines or special pea harvesters, loaded on wagons, and hauled to the factory. They are next put through the vining machine, which separates the peas from the pods. The peas are passed through a fanning mill, which removes the pieces of pods, leaves, and dirt, after which they are washed in wire cylinders known as squirrel cages. The peas are graded for size, either before or after washing. This is usually done by passing them over vibrating screens, with holes of a definite size, or through cylinders with sections having perforations corresponding to those in the screens.

Peas are usually blanched for from 1 to 4 minutes. They are processed at about 235° F. for from 35 to 40 minutes, depending upon their freshness and state of maturity. The canned peas are immediately cooled in order to arrest cooking and insure a clear liquor.

The following standards for canning peas have been adopted by the United States Department of Agriculture and many of the States, upon recommendation of the joint committee on definitions and standards:

Canned peas are the canned vegetables prepared from the well-developed but still tender seeds of the common or garden pea (*Pisum sativum*) by shelling, winnowing, and thorough washing, with or without grading and with or without precooking (blanching), and by the addition, before sterilization, of the necessary amount of potable water, with or without sugar and salt.

Canned pea varieties.—Early peas are peas of early maturing sorts having a smooth skin.

Sugar peas, sweet peas, are peas of later maturing varieties having a wrinkled skin and sweet flavor.

Canned pea grades.—Fancy peas are young, succulent peas of fairly uniform size and color, unless declared to be ungraded for size, with reasonably clear liquor, and free from flavor defects due to imperfect processing.

Standard peas are less succulent peas than the fancy grade, but green and of mellow consistency, of uniform size and color, unless declared to be ungraded for size, with reasonably clear liquor, though not necessarily free from sediment, and reasonably free from flavor defects due to imperfect processing.

Substandard peas are peas that are overmature, though not fully ripened, or that lack in other respects the qualifications for the standard grade.

Canned pea sizes.—No. 1 peas are peas which were, before precooking (blanching), small enough to pass through a screen of $\frac{9}{32}$-inch (7 mm.) mesh.

No. 2 peas are peas which were, before precooking (blanching), small enough to pass through a screen of $\frac{10}{32}$-inch (8 mm.) mesh.

No. 3 peas are peas which were, before precooking (blanching), small enough to pass through a screen of $\frac{11}{32}$-inch (8.7 mm.) mesh.

No. 4 peas are peas which were, before precooking (blanching), small enough to pass through a screen of $\frac{12}{32}$-inch (9.5 mm.) mesh.

No. 5 peas are peas which were, before precooking (blanching), small enough to pass through a screen of $\frac{13}{32}$-inch (10.3 mm.) mesh.

No. 6 peas are peas not all of which were, before precooking (blanching), small enough to pass through a screen of $\frac{13}{32}$-inch (10.3 mm.) mesh.

The inspector should observe the efficiency of the sorting and removal of defective and imperfect peas, the disposal of the vines, and the fill of the cans (page 8). A sample form for reporting a pea-cannery inspection is given on page 18.

PEPPERS.

The pods of peppers are 6 or 7 inches long and from $1\frac{1}{2}$ to 2 inches wide. They are picked green and just before any tinge of red appears. It is necessary to handle them quickly to prevent decomposition, and molding skins are removed from the fleshy portion, either mechanically or by hand, care being taken to leave the pods as nearly whole as possible. In order to loosen the skins, the pods are roasted by being either passed through rotating cylindrical ovens or dipped in boiling oil. Pods are cleaned of most of the seeds, after which they are thoroughly washed in running water, folded, and packed tightly in cans. Some canners spread the pods on trays to dry after washing, then salt and pack them. A liquor containing tomato juice or a weak brine is added, and the cans are capped and processed in boiling water for a period not exceeding 30 minutes.

A small part of the pack is canned for ripe peppers. The pimento or sweet pepper, packed when fully colored, is treated in the same manner, although usually canned in tomato juice.

POTATOES, SWEET.

Sweet potatoes are canned extensively in Delaware and Maryland and in the South. As a general rule, only the smaller tubers are used by the canner. The tubers are placed in baskets or shallow slat boxes and cooked with live steam for about 10 minutes in a suitable inclosure of wood or metal. The hot tubers are taken out and the skin is removed at once, by hand in small plants, or in rotary machines made for the purpose. Those treated in the machines require further hand treatment for the complete removal of bits of skin, roots, etc.

There are two distinct methods of packing sweet potatoes. In one the cans are hand filled completely, the operators using sufficient pressure to mash the soft potatoes and squeeze out all air, the can being completely filled except a slight depression at the top. In the other method, the operators fill the potatoes into the can so that they lie close together but are not mashed, as little space as possible being left as voids. In the first method, the contents turn out as a solid mass, the outline of the individual tubers being lost. In the second method the mass shows the outlines of tubers which can be picked apart and cooked as individual potatoes. The voids or air spaces sometimes give trouble because the potatoes surrounding them are more or less darkened and unsightly, owing to the action of the air. Because of this action of the air, some canners put up a solid pack. Those who pack by the second method give the filled cans a very long, hot exhaust in unusually long exhaust boxes, in this way driving out nearly all of the air, and then seal the hot cans at once, thus securing a finished article which commands a higher price than that packed by the other method. Sweet potatoes require a very long period of processing, especially when packed in No. 10 cans.

PUMPKINS.

Pumpkins, carefully selected for canning, are stemmed and well washed to remove any adhering dirt. They are cut into large pieces, either by knives or roller disks, and are given a general washing in a heavy squirrel cage, the principal object being to remove seed and loose fiber. The fiber is then put in large iron crates and cooked in a retort until it softens, which requires about 20 minutes at 240° F. It is next run through a cyclone which removes the hard part of the skin and the tough fibers. If it is of a good consistency the pulp is cooked very little, but if light or thin it is evaporated until it has the right body. It is filled into the cans while hot, sealed, and processed at 250° F. for 90 minutes. Pumpkins are packed principally in No. 3 cans. In some canneries the seed and pulp are not removed before cooking, as certain packers believe that the seed and fibrous pulp surrounding them produce a better taste.

RHUBARB.

Rhubarb is washed in large tanks of running water and at the same time inspected for any imperfections. It is next cut by means of a series of small saws set an inch apart on a shaft. The rhubarb is laid on a carrier which feeds each stick crosswise to the saws. The cans are then filled and hot water is added to fill the interspaces.

The practice in some canneries is to first strip or peel the stems before they are cut and then heat the rhubarb in a preserve kettle before filling into the can. The cans are processed for about 13 minutes at boiling temperature.

SAUERKRAUT.

Sauerkraut is made by the natural fermentation of cabbage in casks or tanks. For canning it is made in the usual way. The fresher the kraut the better it is for canning. Cans are filled full and weighed, and sufficient hot brine to fill the interspaces is added. The can is then exhausted, capped, and processed at boiling temperature for 25 minutes.

The inspector should give particular attention to the condition of the raw material used in making the kraut, the quality of the kraut, and the fill of the can.

SOUPS.

The great variety of soups canned include beef, bouillon, celery, ox-tail, mock-turtle, chicken, veal, chicken gumbo, consommé, green turtle, clam broth, clam chowder, mutton broth, tomato, tomato okra, vegetable, pea, asparagus, vermicilli, and julienne.

There are no standards for soups; each is made according to the formula of the particular packer. The making of soups is peculiarly a chef's art. All the meat products which go into their composition should be United States Government inspected, as the soups are likely to enter interstate commerce. Soups are classed as meat or vegetable, although there are but few that are not made from some kind of meat stock. The inspector should give particular attention to the kind of meat used.

Fresh vegetables are preferable for making soups, although canned or dried vegetables may prove satisfactory. The vegetables used are prepared separately, washed, peeled, cut into pieces, cubes, or the special forms used by the individual packer, blanched, and in some cases given a separate cooking to secure the proper tenderness. These are mixed in various proportions according to the formula and placed in the cans by weight. The stock is added afterwards. The process depends upon the body, whether thick or thin, and upon the quantity of meat used.

The inspector should give particular attention to the quality of raw material used, the sanitary condition of the factory and equipment, the health of the workers, and the like. Attention should also be given to the label. See that the finished product is labeled in accordance with the products actually put into the can.

SPINACH.

Spinach is canned extensively in California. The canning begins about the middle of March and continues until the last of June, although some is packed also in the fall, between the first of September and the middle of December.

The entire top of the plant is cut off close to the ground, thrown loosely into crates or wagons, and hauled to the cannery. The large stems, the flowering tops, and any discolored or old leaves are separated and discarded by the women operatives. The sorted spinach is then washed thoroughly to free it from sand and adhering dirt, by passing it through a perforated revolving iron drum which rolls it about and sprays it thoroughly with cold water by means of six or more fan sprays running under forced pressure. It is next blanched in boiling water or steam for from 3 to 10 minutes.

Spinach is allowed to drain for a few minutes and then while still hot it is packed in the cans by means of forks or wooden paddles. A salt brine averaging 3 per cent salt is added and the product is exhausted, sealed, and cooked in retorts for varying periods of time according to the size of the can.

The inspector should give particular attention to the net weight of the spinach actually put into the cans exclusive of brine. Sometimes the spinach going into the can is not well drained, in which case the amount of water weighed in as spinach would be large. The sorting and washing process should be carefully observed to ascertain whether all dirt and insects have been properly removed. Careful attention should also be given to the time and temperature of processing and to the methods for controlling them. A number of deaths have been caused by the presence of *Bacillus botulinus* in canned spinach. Thorough sterilization is necessary to prevent the possibility of this danger.

SQUASH.

Squash is canned in the same manner as pumpkin (p. 35), to which it is closely related.

SUCCOTASH.

Succotash is made by mixing green corn and green beans, usually Lima beans. Soaked beans are sometimes used and they should be declared upon the label. In the regular field run of Lima beans,

some will be further advanced than others, while all the pods may be green. In blanching, some of the beans may turn white. On breaking them they may appear mealy and thus when the can is opened, give the product the appearance of being soaked. In fancy succotash these white beans are picked out by hand. The percentage of beans in succotash varies from 20 to 40. The cut corn and blanched beans are mixed, after which they are treated in the same way as corn, being given the same sugar and salt brine, preliminary cooking, and process.

Observe the percentage of beans used, and whether they are green or soaked.

TURNIPS.

After the tops have been removed turnips are delivered to canners in lug boxes, washed in cold water, blanched to facilitate the removal of the outer skin, hand peeled, and quartered. After another washing in cold water they are hand packed, and exhausted for from 5 to 8 minutes at 212° F. The cans are filled with hot brine, capped, and processed in the same manner as beets and carrots. The grades are standards and seconds, with but slight difference between them.

The inspector should give particular attention to the fill of can and to net weight.

OTHER VEGETABLES.

Other vegetables which are canned in relatively small quantities are celery, cucumbers, mushrooms, and okra.

CONCLUSION.

Alertness, vigilance, diplomacy—these are the characteristics of the efficient inspector. No detail bearing on the whole canning process escapes him; no opportunity to secure accurate information from any source is lost. Yet in analyzing his observations he is selective, and in his report he places the emphasis upon the characteristic and vital points. The characteristic points are those which give the cannery under consideration a grade of unsatisfactory, fair, good, or excellent; the vital points are those which, because of the conditions in the cannery, directly affect the quality and wholesomeness of the food in the can.

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